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10/566,099	05/08/2006	Tadahiro Ohmi	039262-0147	9568

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EXAMINER	
BIRBACH, NAOMI L	

ART UNIT	PAPER NUMBER
1792	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/566,099	OHMI ET AL.	
	Examiner	Art Unit	
	NAOMI BIRBACH	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 January 2006* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *01272006, 03032006, 02062009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 7a and 7c. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: Ref. #33 in Figure 3, Ref. #36 in Figure 4, Ref. #39 in Figure 5. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

4. Claim 3 is objected to because of the following informalities: Claim 3 recites "whereincharacterized in that said product....", which is not grammatically proper. It should preferably recite "wherein characterized." Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1-11, and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by USPA 2002/0005213 to Otsuki et al.

10. As to claim 1, Otsuki discloses a silicon carbide product having a surface with a concentration of metal impurities equal or less than $1x10^{11}$(atoms/cm^3) (Page 1, Paragraph [0012]).

11. As to claim 2, Otsuki further discloses that said metal impurities may be Iron, Nickel or Copper (Page 11, Table 1).

12. As to claim 3, Otsuki further discloses that the silicon carbide product is a semiconductor device (Page 1, Paragraph [0002]).

13. As to claim 4, Otsuki discloses a silicon carbide product cleaning method comprising the step of immersing silicon carbide in an acid to reduce surface metal impurities to $1x10^{11}$(atoms/cm^3) (Page 7, Paragraph [0081]; Page 8, Paragraph [0084]).

14. As to claim 5, Otsuki discloses a method of manufacturing a silicon carbide product comprising the step of cleaning silicon carbide with an acid to reduce surface metal impurities to $1x10^{11}$(atoms/cm^3) (Page 1, Paragraph [0013]; Page 8, Paragraph [0084]).

15. As to claim 6, Otsuki further discloses that the acid is hydrochloric or hydrofluoric acid (Page 8, Paragraph [0094]).

16. As to claim 7, Otsuki further discloses that said acid is hydrofluoric acid (Page 8, Paragraph [0094]). Otsuki teaches that the concentration of the organic acid is preferably 0.3 to 68% by weight (Page 8, Paragraph [0095]), which exceeds 45%.

17. As to claim 8, Otsuki further discloses that the hydrofluoric acid (Page 8, Paragraph [0094]) preferably has a concentration of 0.3 to 68% by weight (Page 8, Paragraph [0095]), which includes a concentration of about 50%.

18. As to claim 9, Otsuki further discloses that said acid is hydrochloric acid (Page 8, Paragraph [0094]). Otsuki teaches that the concentration of the organic acid is preferably 0.3 to 68% by weight (Page 8, Paragraph [0095]), which exceeds 35%.

19. As to claim 10, Otsuki further discloses that the hydrochloric acid (Page 8, Paragraph [0094]) preferably has a concentration of 0.3 to 68% by weight (Page 8, Paragraph [0095]), which includes a concentration of about 36%.

20. As to claim 11, Otsuki further discloses that the acid may comprise a mixture of sulfuric acid and hydrogen peroxide (Page 8, Paragraph [0094]).

21. Claim 14 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Otsuki. It is noted that claim 14 is a product by process claim. Otsuki discloses a silicon carbide product manufactured by the method according to claim 5 (Page 1, Paragraph [0013]; Page 7, Paragraph [0081]; Page 8, Paragraph [0084]). Otsuki discloses that the silicon carbide product is a semiconductor device (Page 1, Paragraph [0002]). In the alternative, because of the nature of product-by process claims, the Examiner cannot ordinarily focus on the precise difference between the claimed product and the disclosed product. It is then Applicants' burden to prove that an unobvious difference exists. See ***In re Marosi***, 218 USPQ 289, 292-293 (CAFC 1983).

Claim Rejections - 35 USC § 103

22. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

23. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

24. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPA 2002/0005213 to Otsuki et al.

25. As to claim 12, Otsuki does not expressly disclose that the liquid containing said sulfuric acid and said hydrogen peroxide solution has a pH of 4 or less (Page 8, Paragraph [0094]). However, pH is a result effective parameter, because it affects the acidity of the cleaning solution, thus affecting the processing. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the method taught by Otsuki in order to enhance cleaning efficiency, consult In re Boesch and Slaney 205 USPQ 215 (CCPA 1980).

26. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPA 2002/0005213 to Otsuki et al. as applied to claim 12 above, and further in view of USPN 6,348,157 to Ohmi et al.

27. Otsuki is relied upon as discussed above with respect to the rejection of Claim 12.

28. As to claim 13, Otsuki discloses using sulfuric acid with a concentration of 98% in the cleaning liquid (Page 10, Paragraph [0134]), but does not expressly disclose that the hydrogen peroxide solution has a concentration of about 30% or that the sulfuric acid and hydrogen peroxide are mixed in a volume ratio of 4:1.

29. Ohmi discloses a cleaning solution comprising 97% sulfuric acid and 30% hydrogen peroxide mixed in a volumetric ratio of 4:1 (Col. 8, lines 47-51). Ohmi teaches that this solution is used to clean a silicon substrate (Col. 8, lines 47-51).

30. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method taught by Otsuki to include a 97% sulfuric acid and 30% hydrogen peroxide mixed in a volumetric ratio of 4:1 as taught by Ohmi in order to optimize cleaning, as a solution with these properties has been demonstrated to be effective in removing contaminants from a silicon substrate.

31. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPA 2002/0005213 to Otsuki et al as applied to claim 11 above, and further in view of USPA 2004/0029392 to Morgan.

32. Otsuki is relied upon as discussed above with respect to the rejection of Claim 11.

33. As to claim 12, Otsuki does not expressly disclose that the solution containing sulfuric acid and hydrogen peroxide has a pH of 4 or less.

34. Morgan discloses a known cleaning solution of sulfuric acid and hydrogen peroxide which typically has a pH of no greater than 1, which is less than 4 (Page 1, Paragraph [0008]). Morgan teaches that this solution is used to remove metallic contaminants from a substrate surface (Page 1, Paragraphs [0007]-[0008]).

35. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method taught by Otsuki to include a sulfuric acid and hydrogen peroxide solution with a pH of 4 or less as taught by Morgan to optimize cleaning, as a solution with this pH has been demonstrated to be effective in removing contaminants.

36. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPA 2002/0005213 to Otsuki et al. in view of USPA 2004/0029392 to Morgan as applied to claim 12 above, and further in view of USPN 6,348,157 to Ohmi et al.

37. Otsuki and Morgan are relied upon as discussed above with respect to the rejection of Claim 12.

38. As to claim 13, the combination of Otsuki and Morgan does not expressly disclose that the sulfuric acid and hydrogen peroxide solution respectively have concentrations of about 97% and about 30% and are mixed in a volume ratio of 4:1.

39. Ohmi discloses a cleaning solution comprising 97% sulfuric acid and 30% hydrogen peroxide mixed in a volumetric ratio of 4:1 (Col. 8, lines 47-51). Ohmi teaches that this solution is used to clean a silicon substrate (Col. 8, lines 47-51).

40. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the method taught by Otsuki and Morgan to include a 97% sulfuric acid and 30% hydrogen peroxide mixed in a volumetric ratio of 4:1 as taught by Ohmi in order to optimize cleaning, as this solution has been demonstrated to be effective in removing contaminants from a silicon substrate.

Conclusion

41. The reference to JP 11-8216, indicated on International Search Report as X, is not relied upon because the prior art used in the above rejection more closely discloses the claimed invention.

42. Any inquiry concerning this communication or earlier communications from the examiner should be directed to NAOMI BIRBACH whose telephone number is (571)270-7367. The examiner can normally be reached on Monday-Friday, 8:00am-5:30pm.

43. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Kornakov can be reached on 571-272-1303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

44. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/N. B./
Naomi Birbach
Examiner, Art Unit 1792
2/11/2009
/Michael Kornakov/
Supervisory Patent Examiner, Art Unit 1792